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SHEET METAL FASTENING CLIP

RELATED APPLICATION

This application claims priority of U.S. Provisional Patent Application
Serial No. 60/390,946 filed June 24, 2002, which is incorporated herein by
5 reference.

FIELD OF THE INVENTION

The present invention relates to mounting clips for securing fasteners to
sheet metal and more particularly to a fastener mounting clip that can be
inserted into a bore hole formed in sheet metal material.

BACKGROUND OF THE INVENTION

10 Sheet metal nuts or mounting clips are used in the automobile industry
as well as in the household appliances industry for fastening trim work or other
components to the sheet metal body. Many conventional sheet metal nuts are
designed to be pushed onto the edge of a sheet material work-piece having a
15 hole adjacent thereto until a hole of the sheet metal nut and the work-piece
coincide.

However, many motor vehicle construction processes require that trim
work or other components be fastened to the interior vehicle chassis, exterior
body panels or other fastening points which do not lie at the edge of the sheet
20 material or work-piece but in other areas of the work-piece surface, such as the
middle. For this case, the present invention provides a sheet material mounting

clip that may be received into a bore hole formed in the sheet material and operative to be easily inserted while providing a substantial resistance to pull-out forces.

SUMMARY OF THE INVENTION

5 The present invention provides a fastener mounting clip for securing a fastener in a bore hole formed in sheet materials such as sheet metal or the like. The fastener mounting clip includes a planar surface having an outside edge and a recessed aperture formed central to the planar surface. The aperture is operative to receive and retain a conventional fastener therein for securing
10 various objects such as trim material to the sheet material.

Two elongated guide arms are formed on the outside edge of the planar surface. The guide arms stand spaced apart in an opposing fashion and extend beneath the planar surface at an obtuse angle. The guide arms are operative to guide the mounting clip into the borehole formed in the sheet material.

15 Two resilient retaining arms are also formed in opposing fashion on the outside edge of the planar surface. The arms stand spaced apart in an opposing fashion and also extend beneath the planar surface at an obtuse angle that is preferably equivalent to the obtuse angle of the guide arms. The retaining arms are operative to compress and expand upon insertion of the fastener mounting
20 clip into the borehole formed in the sheet material. After insertion of the fastener mounting clip into the bore hole, the top sides of the expanded retaining arms abut against a surface of the sheet metal and provide resistance to pull-out forces.

At least two support tabs extend outwardly from the outside edge of the planar surface preferably in opposing directions such that the two tabs would be spaced apart substantially at 180 degrees. The tabs are operative to abut against an opposing surface of the sheet metal relative to the surface in contact
5 with the retaining arms after the fastener mounting clip has been fully inserted into a bore hole of the sheet metal. The tabs are operative to prevent the mounting clip from passing through the borehole during insertion and to stabilize the mounting in the sheet material.

BRIEF DESCRIPTION OF THE DRAWINGS

10 A better understanding of the present invention will be had upon reference to the following detailed description when read in conjunction with the accompanying drawings in which like parts are given like reference numerals and wherein:

Figure 1 is a perspective view of the first preferred embodiment of the
15 fastener mounting clip for sheet material;

Figure 2 is a cross-sectional view of the fastener mounting clip of Figure 1;

Figure 3 is a side view of the fastener mounting clip illustrating the retaining arms as according to the invention;

20 Figure 4 is a side view of the fastener mounting clip illustrating the guide arms as according to the invention;

Figure 5 is a perspective view of an alternative embodiment of the fastener mounting clip comprised of a two-piece assembly;

Figure 6 is a side view of the fastener mounting clip assembly disposed in a bore hole formed in a piece of sheet material;

Figure 7 is an end view of the fastener mounting clip assembly as according to the invention; and

5 Figure 8 is a top view of the fastener mounting clip assembly as according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a novel fastening clip for use in providing a mounting for fasteners used to fasten objects to sheet material
10 bodies having boreholes formed therein. The fastener mounting clips are operative to require low insertion force and to provide high retention force. Thus, the inventive fastener mounting clips are easily installed and mount securely to sheet materials having boreholes formed therein.

As shown in Figures 1-4, the preferred embodiment of a fastener
15 mounting clip 10 is formed from a single sheet of metal such as spring steel, aluminum, tin or copper.

The fastener mounting clip 10 includes a planar surface 12 preferably formed in a rectilinear shape. However, it is appreciated that various other shapes may be suitable for the intended purpose without exceeding the scope of
20 the invention.

The planar surface 12 includes a recessed aperture 14 formed central thereto that is dimensioned to receive and retain a complementary fastener

therein. The aperture 14 may be threaded, barded, or provide any other complementary engagement means for securing a conventional fastener.

At least two elongated guide arms 18 extend from and beneath an outside edge 16 of the planar surface 12. Each guide arm 18 includes a U-shaped free end 20 operative to guide the fastener mounting clip 10 into a bore hole formed in the sheet material. The free end 20 of each guide arm 18 may alternatively be formed into a V shape or truncated V shape or any other shape that would provide the benefit of minimizing the amount of insertion force required for installing the fastener mounting clip 10 into a bore hole formed in the sheet material. Preferably, the guide arms 18 are spaced apart at approximately 180 degrees in an opposing fashion. Although two guide arms 18 are preferable, the inventive fastener mounting clip 12 could be made operable with at least one guide arm 18.

At least two resilient retaining arms 22 are also formed on the outside edge 16 of the planar surface 12. The retaining arms 22 extend beneath the planar surface 12 similar to the guide arms 18. Preferably, the retaining arms 22 include a top end 24 and a bottom end 26 which are essentially the extreme ends of the retaining arms 22 that are preferably formed to resemble elongated loops. The retaining arms 22 are operative to compress and expand upon insertion of the fastener mounting clip 10 into the bore hole formed in the sheet material wherein the top ends 24 of the retaining arms 22 abut against a bottom surface of the sheet material when the fastener mounting clip 10 is fully inserted into the bore hole.

The bottom end 26 of the retaining arms 22 are shrouded by the U-shaped free ends 20 of the guide arms 18. In this fashion, the retaining arms 22 of the fastener mounting clip 10 are protected against being deformed by insertion forces acting on the bottom end 26 during insertion. It is appreciated that although the preferred embodiment employs two retaining arms 22, the inventive fastener mounting clip 10 could be made operative with at least one retaining arm. The retaining arms 22 are preferably arranged in opposing fashion and complementary to the guide arms 18 such that the retaining arms 22 also stand substantially 180 degrees apart.

At least two support tabs 30 extend outwardly from the outside edge 16 of the planar surface 12. Preferably, the tabs 30 are arranged in an opposing fashion such that they extend outwardly from the planar surface 12 at substantially 180 degrees. The support tabs 30 are operative to abut against a top surface of the sheet material when the fastener mounting clip 10 is fully inserted into a bore hole formed in the sheet material. As such, the fastener mounting clip 10 is securely retained in the bore hole formed in the sheet material wherein the top ends 24 of the retaining arms 22 abut against the bottom surface of the sheet material and wherein the support tabs 30 abut against the top surface of the sheet material. In this fashion, the fastener mounting clip 10 is resistant to pull-out forces as well as push-through forces experienced during insertion. The tabs also serve to stabilize the fastener mounting clip 10 within the borehole.

It is appreciated that the fastener mounting clip 10 includes a spaced distance D between the support tabs 30 and the top ends 24 of the retaining arms 22 wherein the distance D approximates the thickness of the sheet material for which the fastener mounting clip 10 is to be used. This distance D and the resiliency of the support tabs 30 are operative to compensate for surface inconsistencies as well as to ensure that the sheet material will be snugly sandwiched between the top ends 24 of the retaining arms 22 and the support tabs 30 after the fastener mounting clip 10 has been inserted into the bore hole.

Referring now to Figures 3 and 4, the side views of the fastener mounting clip 10 illustrate the retaining arms 22 and guide arms 18, respectively, extending beneath the planar surface 12 at obtuse angles. Preferably, the obtuse angles range between 90 and 120 degrees. Most preferably, the angles range between 95 and 105 degrees. It is appreciated that other angles that exceed these ranges may be suitable, however, without exceeding the scope of the invention.

Figures 5-8 illustrate a fastener mounting clip assembly 10' as an alternative embodiment to the above fastener mounting clip 10 that is formed of a single piece of sheet material.

The fastener mounting clip assembly 10' also has utility for securing a fastener to sheet material having a borehole formed therein. As best illustrated in Figure 5, the fastener mounting clip assembly 10' includes a U-shaped retainer portion 50 and a U-shaped carrier portion 64.

The U-shaped retainer portion 50 includes a U-base 52 having an aperture 54 formed at its center. Extending upwardly from the U-base 52 are opposing spring arms 56. Each spring arm 56 includes a U-shaped notch 58 formed between two retaining wedges 60 that extend along the outer edges of the spring arms 56. Each of the retaining wedges 60 has a tapered end adjacent to the U-base 52. The U-base 52 of the U-shaped retainer portion 50 preferably includes at least one stabilizer tab 80 disposed adjacent the aperture 54 formed therein for the purpose to be described hereinafter.

The U-shaped carrier portion 64 is dimensioned to engage the U-shaped retainer portion 50 in a complementary fashion wherein the U-base 52 of the U-shaped retainer portion 50 seats within the carrier base portion 66 of the U-shaped carrier portion 64.

Extending upwardly from the carrier base 66 is a protruding cylindrical aperture 68 formed central thereto. The cylindrical aperture 68 is dimensioned to be received through the aperture 54 formed in the U-base 52 of the U-shaped retainer portion 50. The protruding cylindrical aperture 68 is operative to receive and retain a fastener in complementary therein.

As described above, at least one stabilizer tab 80 is disposed at the center aperture 54 of the U-base 52 of the U-shaped retainer portion 50. The stabilizer tabs 80 are operative to retain and stabilize the protruding cylindrical aperture 68 of the U-shaped carrier portion 64 upon assembly of the fastener mounting clip assembly 10' as according to the invention.

The U-shaped carrier portion 64 includes opposing inverted L-shaped arms 70 having a body portion 72 and a base portion 74. The body portion 72 of the opposing inverted L-shaped arms 70 extends upwardly from the carrier base 66 while the base portions 74 extend outwardly from the carrier base 66 in a winged fashion.

The body portion 72 of the inverted L-shaped arms 70 each include bilateral notches 76 such that the body portion 72 appears to have an I-beam shape. The bilateral notches 76 are dimensioned to interlockingly engage the retaining wedges 60 of the spring arms 56 after assembly. In this manner, the U-shaped retainer portion 50 and the U-shaped carrier portion 64 form the fastener mounting clip assembly 10' as according to the invention.

The fastener mounting clip assembly 10' is dimensioned to be received in the bore hole formed in the sheet material such that the retaining wedges 60 compress and expand during insertion and abut against a bottom surface of the sheet material when the fastener mounting clip assembly 10' is properly seated within the bore hole.

Additionally, the base portion 74 of the inverted L-shaped arms 70 abut against a top surface of the sheet material after proper insertion of the fastener mounting clip assembly 10' as according to the invention. It is appreciated that a distance D' exists between the top surface of the retaining wedges 60 and the base portion 74 of the inverted L-shaped arms 70 such that the sheet material having a thickness approximately equal to the distance D' may be snugly positioned therebetween. The resiliency of the base portion 74 of the inverted

L-shaped arms 70 allows for inconsistencies in the thickness of sheet materials for which the fastener mounting clip assembly 10' is to be used.

Preferably, the fastener mounting clip assembly 10' is formed of spring steel, aluminum or copper. However, it is appreciated that other materials such as resiliently rigid plastic materials may be constructed and made suitable for the intended purpose as according to the invention.

From the foregoing it can be seen that the above embodiments provide a fastener mounting clip for use in securing a fastener in a bore hole formed in sheet material or a body formed thereof. Having described the invention, however, many modifications thereto may become apparent to those skilled in the art to which it pertains without deviation from the spirit of the invention as defined by the scope of the appended claims.

We claim: